

STATE OF COLORADO

Roy Romer, Governor
Patti Shwayder, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

HAZARDOUS MATERIALS AND WASTE MANAGEMENT DIVISION
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Colorado Department
of Public Health
and Environment

July 17, 1998

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RE Approval of Permit Modification Request #97-8

Dear Mr Legare and Ms North

The Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division (the Division), has reviewed Permit Modification Request #97-8 submitted by the Department of Energy and Kaiser-Hill on April 24, 1998. This Class 2 permit modification request proposes the addition of treatment Unit 865 3 - Macroencapsulation of Low Level Mixed Debris Waste to the Rocky Flats Environmental Technology Site (RFETS) Hazardous Waste Permit. The Division hereby approves Permit Modification #97-8. In accordance with Section 100 511(b)(2) of the Colorado Hazardous Waste Regulations, this approved permit modification shall become effective immediately. Procedures for appeal of this decision are contained in Section 100 514. Revised pages to the Rocky Flats Environmental Technology Site Hazardous Waste Permit are enclosed. If you have any questions concerning this matter, please contact Chris Gilbreath at (303) 692-3371.

Sincerely,

Joe Schieffelin
Permitting and Compliance Unit Leader
Federal Facilities Program

cc T Rehder, EPA
Jefferson County Health Department



ADMIN RECORD

SN-A-000002

Modification No 98-3 Effective Date March 18, 1998

Modification to the description of Types of Storage Containers, addition of "P" and "U" Series waste codes in Unit 1 and 10, revision to storage of peroxide forming compounds in Unit 1, and revised drawings for Unit 59 and 374 1

Modification No 97-3 Effective Date April 17, 1998

Addition of the Combustible Residues Stabilization Process (Unit 371 3b) in Building 371

Modification No 98-4 Effective Date May 5, 1998

Modification to container configurations in Units 371 1 and 777 1 to accomodate new nuclear material safeguards requirements, addition of waste code in Unit 1, revised drawings for rooms in Unit 371 1, 440 1, and Unit 777 1, and addition of vault in Unit 777 1

Modification No 97-8 Effective Date July 17, 1998

Addition of treatment Unit 865 3 Macroencapsulation of Low-level Debris Waste

PART V - TREATMENT UNITS

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The Macroencapsulation of Low-Level Mixed Debris Waste process is a solidification and stabilization treatment process that will be used to immobilize low-level mixed debris waste. Immobilization technologies such as macroencapsulation are identified as "alternative treatment standards for hazardous debris" in 6 CCR 1007-3, Part 268 45.

The debris wastes to be macroencapsulated were originally generated during weapons production and research and development activities, and contain a mixture of low-level radioactive components and hazardous constituents, including beryllium. The final waste form is intended to meet the Envirocare of Utah Inc. waste acceptance criteria.

This treatment process may be performed at alternate locations provided that the Division is notified at least 7 days prior to treatment being initiated. A copy of the notice will be filed in the Site operating record.

Process Description

In the macroencapsulation process, the radioactively-contaminated debris will be placed into a drum, and an epoxy resin will be poured around it in order to isolate the debris from the environment with a continuous barrier. This method of waste isolation meets the requirement in 6 CCR 1007-3, Section 268 45, Table 1 for "application of surface coating materials, such as polymeric organics (e.g., resins and plastics), or use of a jacket of inert organic materials to substantially reduce surface exposure to potential leaching media."

Three materials are utilized in this process:

- I Epoxy resin, such as D E R 324 resin, which is made by Dow Chemical Company,
- II Curing agent, such as Ancamide 502, made by Air Products and Chemicals, and
- III Sub-bituminous coal fly ash (as a filler for the resin)

The composition of the epoxy mixture is approximately 53% resin, 27% curing agent and 20% fly ash by volume.

The process itself can be summarized in four major steps:

- I Waste preparation,
- II Epoxy mixing,
- III Polymer encapsulation, and
- IV Curing

In the waste preparation step, bulk wastes are placed into an open mesh basket which is approximately three inches smaller in diameter and height than the disposal container (e.g., 55-gallon drum). Spacers may be used on the bottom and sides of the basket to keep the basket centered within the container. It has been demonstrated in treatability studies that a minimum distance of one and one half inches between the basket and the container wall is necessary for structural integrity of the polymer, especially while it is curing. When lead-containing materials are being encapsulated, additional support will be applied to the bottom of the basket.

The epoxy mixture is prepared in a container using an approximate resin to curing agent ratio of 70 30 by weight. Sub-bituminous coal fly ash is then added to the mixture to a loading of 40% fly ash by weight. Mixing is conducted using a low shear mixer for ten minutes.

After the waste configuration and epoxy/fly ash mixture have been prepared, the mixture is poured into the waste container. It is important to assure that all voids in the waste have been filled with the mixture, and that the mixture covers the waste and basket to a depth of at least one and one half inches. Polymer curing will then proceed over the next two days. During the curing step, the polymer is expected to reach a peak exotherm of approximately 170°C within eight hours, and then slowly cool to room temperature. The waste container may be moved after only 24 hours of curing without disturbing the immobilized waste configuration.

General Safety Features

The Permittee will maintain a method to analyze, establish, and implement radiation and standard industry hazard controls necessary to safely support the operations associated with this process. The method will be implemented in accordance with the Macroencapsulation Technical Operations Order. Operating personnel will be trained to deal with safety hazards associated with this treatment process which for this treatment unit includes Beryllium training.

Waste Inspection and Analysis

Evaluation of the waste subject to this treatment process will be conducted in accordance with the "Macroencapsulation Technical Operations Order" and applicable regulations. Prior to macroencapsulation, representative sampling and radiation level testing will be performed in accordance with Envirocare of Utah, Inc. requirements.

Pre-treatment waste inspection requires the availability of Real Time Radiography tapes and waste assay results verifying that each drum of waste awaiting treatment is less than 100 nanocuries per gram (nCi/g). Pre-treatment waste inspection will consist of visual verification that liquids or other materials incompatible with the epoxy curing process are not present. If liquids are found, they will be removed, if possible, and transferred to a waste storage unit. The remaining waste will be macroencapsulated. If it is not possible to remove the liquids, the waste will be returned to storage. Some waste which has free liquids characterized with D and F codes may require pre-treatment prior to macroencapsulation. That waste will remain in permitted storage until a solvent removal pre-treatment process is developed and permitted. Waste without free liquids characterized with D and F codes may be directly encapsulated without the pre-treatment process.

Pre-treatment waste inspection will also consist of visual verification that the waste to be treated is solid and greater than or equal to 60 millimeters or 2 inches in any dimension. Confirmatory visual inspection of the waste per these same requirements will also occur during the macroencapsulation treatment process.

Post-treatment inspection of the treated waste monolith will consist of removal of the rigid liner from the treated drum, and visual inspection for voids and pieces of debris waste jutting from the exterior of the treated waste monolith. Post-treatment inspection of the treated monolith will be performed in accordance with Envirocare of Utah, Inc.'s waste acceptance criteria. Exposed voids and debris jutting from the exterior of the treated waste monolith will require re-treatment of the treated monolith via additional polymer macroencapsulation in an overpack drum.

Process Procedure

The Macroencapsulation of Low Level Mixed Debris Waste process will be operated in accordance with an approved procedure entitled "Macroencapsulation Technical Operations Order"

Treatment Unit Information

A treatment process specific conditions sheet and equipment layout drawing are provided in this section

TREATMENT PROCESS SPECIFIC CONDITIONS SHEET

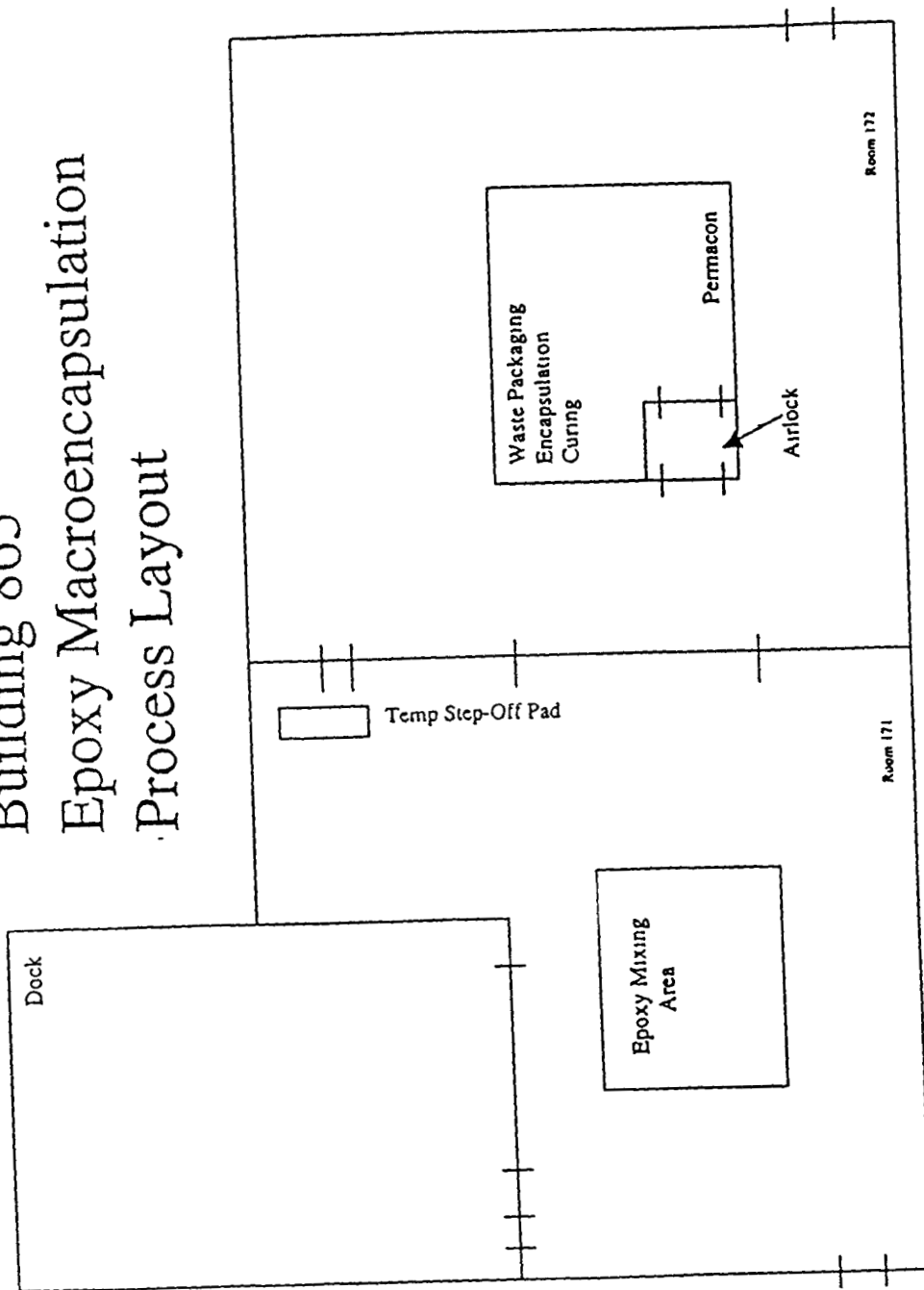
2a Unit 865.3 - Building 865 (Macroencapsulation of Low Level Mixed Debris Waste)

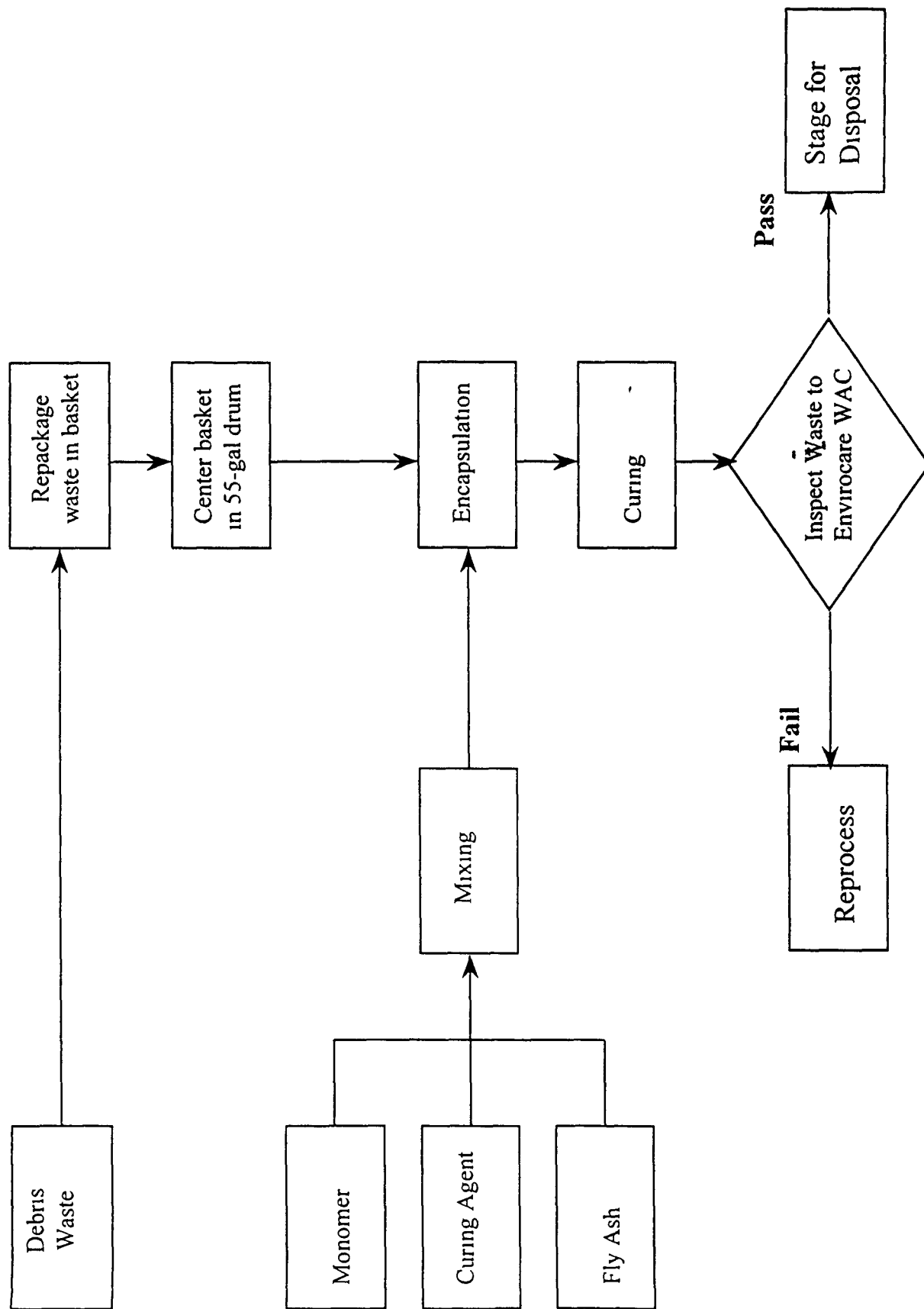
Location.	Building 865 and various locations on site (case-by-case determination)		
Process Equipment.	Radiological Containment Cell (temporary structure), 55-gallon drum, mesh basket, resin mixing equipment		
Treatment Process.	Solidification and Stabilization		
Design Capacity			
Treatment Process	8 - 55-gallon drums per shift		
Operating Capacity			
Treatment Process	4 - 55-gallon drums per shift		
Equipment Dimensions	55-gallon drum	23 in OD x 32 in H	
(inches)	Type IV Rigid Liner	22 in OD x 31 in H	
	Macroencapsulation basket	18 in OD x 25 in H	
	Epoxy mixing containers,	5 gallons volume	
Waste Codes	D004, D005, D006, D007, D008, D009, D010, D011, F001, F002, F005, F006, F007, F009, P015		
Waste Description	Solid Low Level Mixed Debris Waste No free liquids		
Secondary Containment			
Type	N/A		
Minimum Berm Ht	N/A		
Drawing Number	N/A		
Inspection Method	Visual		
Process Control			
Variables			
Container Size	Use only 10-, 55-, or 83 gallon containers		
Maximum thickness			
of plastic surrounding			
the waste in basket	8 inches of plastic		
Basket size	Diameter = 19 in \pm 1 in		
	Height = 26 in \pm 1 in		
Minimum thickness			
of plastic surrounding			
the waste in basket	2 inches of plastic/55 gallon container		
Maximum drum weight			
including monolith	800 lbs		
Waste monolith bulk density	70 lbs per ft ³		
Overfill Prevention	N/A		

Process-Specific Conditions

- 1 At least 30 calendar days prior to operation, the Permittee shall submit copies of the approved work instruction for Macroencapsulation of Low Level Mixed Debris Waste to the Division
- 2 If the top surface of the solidified epoxy is more than one inch from the top of the rigid liner, then additional epoxy will be poured on the surface and allowed to cure before the treatment is considered complete
- 3 The rigid liner may be removed from the macroencapsulated monolith for visual inspection, as feasible

Building 865 Epoxy Macroencapsulation Process Layout





Epoxy Macroencapsulation Process Schematic